

Eggleson (E.R.)

NATURAL LAW

APPLIED TO

ETIOLOGY.

E. R. EGGLESTON, M. D., Mt. Vernon, Ohio.



The more general discussion of principles underlying Sanitary Science has been crowded into the background by the pressure of special features or bearings of the subject, but the present period marks another transition;—that is to say, we move again toward general principles. The demand of the times is for an investigation and explanation of the efficient nature and modes of propagation and perpetuation of the material causes of disease—epidemic disease, especially. To bring the fact forcibly to mind I may refer to that great unsettled theory which numbers among its adherents some of the great minds of the age, and which, as given, is yet too full of inconsistencies and absurdities to make a greater claim upon our acceptance than that of an hypothesis, the germ theory of disease. Now this theory has a practicable, a strong side—one that will bear the closest scrutiny, which may be stated as follows: (1) The atmosphere is filled with germs, innocent, innocuous, conserving the purposes of nature as agents in the decomposition of vitalized matter; (2) the normal germ never attacks vitalized matter; (3) having attacked dead matter, and been propagated in it, it becomes an abnormal germ,

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capable of disseminating the noxious element of the matter in which it is propagated; (4) the normal atmospheric germ, it is safe to say, never did and never will cause disease; while, it is equally safe to say, the abnormal, noxious germ of decomposition, always has, and will cause disease. Thus much from the discussions upon the subject may be accepted as proven, and nothing else.

But, admitting all that critical science of the present time may admit regarding the germ theory, or any other theory of standing, we have still to face the question as to the prime cause of disease, and thus we turn again to general principles.

No theory yet explains the causes of the widespread depression of vitality which invariably attends prevalent epidemics of degenerative or zymotic type; if it did we should know why, during certain seasons all, or nearly all, acute diseases are asthenic in character; or in another case why they are sthenic. No theory yet explains the cycles of epidemics; if it did the labors of those in sanitary authority would be simplified, and not so easily misdirected, and the prognostications of physicians would be more certain and satisfactory.

It is no new belief that is urged, nor is it one that is untried, or unheeded, or unappreciated, to some degree, but it is, so to speak, undefined, and unconsciously applied. Surgeons are painfully aware of larger losses during certain years or seasons, operative procedures being of similar nature and grade of severity, and no less skillfully performed;—the varying results are unaccounted for. Physicians observe tendencies to types of disease, and upon them prognosticate their epidemic or leading remedy; they admit into their prognostic estimates the diurnal variations of intensity of morbid action—exacerbations and remissions; they admit the results of climatic and thermal vicissitudes, of atmospheric perturbations, of the presence or absence of ozone, of the excess or deficiency of positive atmospheric

and negative terrestrial electricity; and yet with how little of the clear understanding so necessary to practical application, how little of that inexorable logic which deduces from demonstrable facts!

I shall not presume to present an ultimatum upon these topics, to equalize all inequalities, nor to make logical all that is illogical, but I do hope to indicate a means for a scientific determination of every question indicated, and with them a host of others more or less subsidiary.

Why do certain diseases become epidemic? Because, 1st, Preceding or simultaneous with the major epidemics there are wide-spread states of depression of the animal powers, which determine marked susceptibility to the contagium of the prevailing disease. I believe the experience of every observant physician will substantiate the proposition. Perhaps the most noticeable instances are during epidemics of typhoid, malarial and yellow fevers, cholera, dysentery and diphtheria. Tissue degeneration is a marked feature of them all, and during their prevalence most cases of acute disease, especially if attacking similar tissues, present, in some degree, characteristic features of the type. Nor is this all. Wider observation must demonstrate the fact that states of relative good health, during the reign of these depressing influences, are degraded. 2d. Because the morbid element finds in the prevailing conditions of degradation the conditions most congenial to its propagation and perpetuation. This, in the very nature of things, is a necessary consequence. For, the preceding being true, there is no longer the normal degree of vital power in animal bodies, so, of course, there is no longer the normal degree of vital resistance, or, the more conditions become unsuitable to normal vitality, the more they become suitable to morbid action.

Referring once more to disease germs, it is seen how conditions for their propagation are thus fulfilled; for even if animal matter with which they are brought in contact is

not totally devitalized, it is so degraded as to determine the *susceptibility* so widely recognized, and increasing susceptibility, more virulent contagium, and greater malignity of disease, go hand in hand with, and in strict proportion to, the intensity of causes of depression of animal vigor. On such grounds it is easily understood why sporadic cases of the diseases which are capable of becoming epidemic, do not become so; why they manifest so little malignancy; why they are so little contagious, and why little or not at all infectious. While, therefore, it may not be strictly true that disease never is caused by germs it does appear to be true that disease never is caused by germs except they have been propagated in a diseased tissue, the specific character of which they represent.

From such premises it is difficult to avoid the conclusion that animal bodies are responsible, in the second instance, for their own morbid states,—the first depending upon the external conditions referred to. Spontaneous or self-generating specific diseases are not strange to the experience of any practitioner, puerperal septicaemia, specific parotitis, scarlatina, and diphtheritic angina have fallen under my own observation, for the cause of which I unhesitatingly deny exposure to an infected atmosphere, to contagious germs, to foreign agencies of any and every sort. It is very easy to say we don't know about these exposures;—I say we do know—it is our business to know. The proof is within our reach in our ability to trace backward to the very depraved functions and tissues which gave rise to such objective signs. It may be concluded, then, that behind all the manifestations of the specific diseases, there are forces not acting at equilibrium, conditions not neutralized by others, the results of the operations of which are phenomenal, and as far as the individual is concerned, degenerative and destructive.

Therefore, I believe that the ultimate causes of epidemic diseases will be found to be in the abnormal or unusual

operations of the natural forces; that these induce in animal bodies states of depression, unusual susceptibility, and tissue degradation; that these in their turn breed their own morbid action, or lay the individual open to onsets from innumerable disease elements, material or otherwise, including germs. The forces concerned in these results are:

1. *Electricity*, with its modifications, positive, negative, magnetic and ozonic; and its transformations or correlatives heat and light, with their modifications.
2. *Gravitation*, with its modifications.
3. *Atmospheric Pressure*, with its concomitants.

Whether it is true or not, as some meteorologists claim, that all the great atmospheric and oceanic currents are caused by the expansibility and rarefaction of heated matter, it is a fact that electricity is an ever-present active factor, and its activity is modified and its potential varied with every change that occurs in the movements of the air and the ocean. Instability, then, is characteristic of electricity. It is true, further, that atmospheric electricity is always positive, and that the symbol of its power may be increased or diminished; hence its intensity is variable. But as its power is relative merely, being measured from a standard of neutrality, it appears that the less positive conditions become the more negative. Now it can be shown that positive electrification is the necessary normal condition of a healthy invigorating atmosphere, and that in the same degree that its amount becomes diminished, or is neutralized by the accession of negative states, in the same degree does it become abnormal and devitalizing.

It is an extraordinary fact that all manifestations of life have as a condition the evolution of positive electricity. It is also true that negative states and animation are absolutely incompatible. This condition of living bodies is a variable one, and that independently of external influences. Now if the electrical norm of a living body is degraded from causes within itself, and in addition is subject to further

degradation from the neutralization of the atmospheric positive state, which is a source of supply independently of bodily sources, it is not easy to avoid the conclusion that these causes, one or both, operate as predisponents to morbid action. Further, the same conditions prevailing over wide areas, and through long periods of time, as they unquestionably do, we are furnished with the cause of the states of least resistance or depression of vitality which is so constantly an element of pestilential activity. Admitting deficiency, we must admit excess, and doing so we account for the prevalence of the acute inflammatory, or sthenic diseases, as well.

Magnetism is classed as a modification of electricity, yet I believe the terms to be conditionally convertible; for it seems to me that they are forms of the same force operating under different circumstances, that is to say, magnetism belongs to the universe—is the bond of union of its members, while electricity belongs to the atmosphere of the earth, and to it alone. In short, electricity is mobilized magnetism; or, magnetism is mobilized static electricity. Its origin being in solar activity, and its influence including every body in our system, it is seen that its consideration must include too much solar and planetary physics to be brought within the limits of this paper. It may be said, however, that to it, in the end, may be brought home each and every point.

Notwithstanding the conflicting opinions regarding ozone, I am disposed to adopt that of Prof. Kedzie, who says: "I call ozone the most energetic of the constituents of the atmosphere. Its presence or absence must have a controlling influence over the vital powers, and it seems to me that no one can deny that its influence on human health must be most significant." Flippant denial of its existence in a normal atmosphere is easily made, but the results of observations by men of world-wide reputation and of unimpeachable standing in the scientific world, place it beyond

the reach of irresponsible denials. The lights of such observers as Shoenbein, Faraday, Boeckel, Dove, Moffatt, Lowe, Day, and Tyndall, cannot be incontinently snuffed out. From among the multitude of facts concerning this agent, one only is selected for this occasion, and that more for the purpose of giving it the emphasis which it deserves, than to enter a discussion on it. Adopting the definition of the action of atmospheric ozone, some consideration is due to the circumstances attending its appearance and disappearance. The transformation of simple oxygen into a substance having such peculiar chemical activity, takes place under the action of free atmospheric electricity. If there is little or no free electricity in the air, then little or no metamorphosis of oxygen occurs. Such being the fact we are able to say pretty definitely in what conditions of the atmosphere ozone is present, or otherwise. At the outset we are struck with the remarkable complementary relations existing between meteorological conditions and those which determine the presence or absence of ozone; for, whereas, in the one case there is high barometrical pressure, with cooler, purer, highly electrified air being poured down upon the earth's surface from the upper regions, bringing with it free electricity in abundance; in the other case opposite conditions prevail;—a heated, attenuated, vapor-laden atmosphere at a low pressure, which has absorbed not only the free electricity, but has greatly neutralized the electrically positive state of the air, in the vaporization of the water which it contains. Under the first class of phenomena ozone is generated; under the other it is not only generated, but that which is already present is decomposed to furnish the electrical force essential to the process of vaporization. Between these opposite states of the atmosphere lies all the difference between health and disease; for the phenomena of one side are conservative and protective, and on the other they are destructive.

It must occur to our minds that with the atmosphere at

or near its mean or electrically positive state; with a sufficient quantity of free electricity to subserve the processes of evaporation and the generation of ozone in sufficiency to oxydize organic noxious emanations or miasmas; with an equilibrium between the positive atmosphere and the negative earth; with equalization between the sometime electro-positive antagonisms of animal life and the atmosphere; and with such relations of polarity between the animal and the earth as to preclude violence, that animal life is at its highest point of conservatism. Now every condition specified may be reversed, or any one of them; some may operate with extreme violence, others far below the mean or not at all. Is it not apparent that with fluctuations of these mean states the vitality of every living thing has such a tax laid upon it that, instead of its powers of existence alone being called into the account, its powers of resistance are laid under contribution as well? But suppose these deleterious fluctuations extend through long periods of time, and over wide areas of the earth's surface;—must the fact be again emphasized that this is one of the prime conditions of a wide-spread epidemic state?

For instance:—It is recognized that the general characteristics of human constitutions are not types each of another, but that elementary variations occur. So marked is this peculiarity that arbitrary classifications have been found necessary to express it. Since members of these classes began as they continue, we infer that some pre-natal influence has determined the peculiarity. Such influences should undoubtedly enter into our estimates of individual predisposition, and we are bound to enquire into the origin of them. Now suppose that over a specified time and place such conditions are prevailing that the vitality of human beings is depressed in a peculiar manner. An inference is that pregnant women are vitally depressed also, and that their offspring will receive the same or similar morbid impressions, and are, therefore, predisposed to states of low

vitality. Whether the "constitutions" of writers may be thus in part explained, or not, it certainly offers a plausible explanation of some epidemics among infants.

It would be unprofitable in the present state of knowledge upon the subject, to enter upon speculations regarding the relations of light and heat with states of health, but in the investigations of the future they will not pass unheeded. *Light* may be dismissed from present consideration with a single remark: As its source is fluctuating, so it must vary in intensity; as physical existences are conditioned to a mean of its intensity, according to the latitude in which they are placed, so their vigor is or is not maintained according as the supply departs or not from a mean intensity. More should be said regarding *heat*, but it, also, must be dismissed with little remark. From the fact that the extent and prevalence of such diseases as yellow fever, typhus fever, phthisis pulmonalis, and catarrhal diseases, are more or less rigidly marked by degrees of north and south latitude, it follows that deviations from common thermal intensities within these ranges must be coupled with advancing or receding averages; and the vicissitudes along the borders of these regions should mark a narrower or wider prevalence of these diseases.

The other topics, *atmospheric pressure* and *gravitation* must remain for future consideration, as well by reason of the tax upon the society's patience, as on account of its inflexible rule which protects against the infliction. Suffice it to say that the grounds are as strong as in the case of electricity for supposing that their normal or abnormal operations maintain or disturb the plane of healthful life. So similar, indeed, are the effects of their variations to those already considered, that what may be said of one, is true of the others. In fact, a compound gradient may be formed, which may embrace each element, to rise and fall above or below an assumed mean, and which unerringly indicates departure or otherwise from a standard of health.

Finally, to bring the whole subject within the realm of professional respectability, I can do no better than quote from Prof. Richardson's *Diseases of Modern Life*: "Withal, there is a general, if unwritten, knowledge, that certain marked events of disease, are often found occurring together, as if they depended upon some common influence. There are epidemic visitations. There are accumulated instances of sudden death from apoplexies, hemorrhages, congestion of the lungs, failures in the motion of the heart. The operating surgeon has a long run of successful operations, even of severe operations; then he has a long run of fatal operations, in which he knows that the severity plays no part in the general result. When we put all these facts together, though we even call them coincidences, for want of a better term, they point circumstantially to the limitation of the phenomena of disease, and to the dependence of these phenomena, however apparently varied, upon the operation of a few causes, active and external. The external causes which give rise to the phenomena of disease have remained steadily in operation, producing repetition of the phenomena in such systematized order, that from patient study of history we might predict the recurrence of some of the phenomena, as astronomers predict the return of comets and the recurrence of eclipses. The causes have remained unchanged; the phenomena have followed with the precision of natural law."